(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

CORRECTED VERSION

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
8 January 2004 (08.01.2004)

PCT

(10) International Publication Number
WO 2004/004194 A3

(51) International Patent Classification[7]: H04L 1/00

(21) International Application Number:
PCT/IB2003/002784

(22) International Filing Date: 17 June 2003 (17.06.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
02014411.9 28 June 2002 (28.06.2002) EP

(71) Applicant *(for all designated States except US)*: **INTERNATIONAL BUSINESS MACHINES CORPORATION** [US/US]; New Orchard Road, Armonk, NY 10504 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **JELITTO, Jens** [DE/CH]; Saeumerstrasse 11, CH-8803 Rueschlikon (CH). **NOLL BARRETO, Andre** [BR/BR]; R. Gustavo Sampaio 194 ap. 303, CEP-22010-010 Rio de Janeiro, RJ (BR). **TRUONG, Hong, Linh** [DE/CH]; Rifertstrasse 30b, CH-8134 Adliswil (CH).

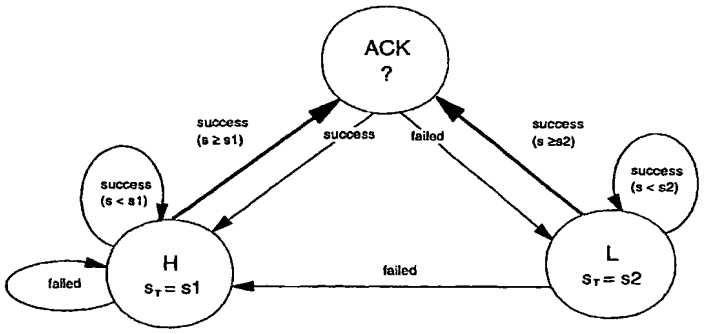
(74) Agents: **KLETT, Peter, M.** et al.; International Business Machines Corporation, Saeumerstrasse 4 / Postfach, CH-8803 Rueschlikon (CH).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: LINK ADAPTATION



failed: s := 0, f+, and
if f ≥ f_T, then down rate and f := 0
success: s+, f := 0, and
if in state H: s ≥ s1 or in state L: s ≥ s2, then up rate and s := 0

e.g.: f_T = 1, s1 = 3, s2 = 10

(57) Abstract: The present invention discloses an apparatus and method for adapting a transmission parameter in a transmitting node of a data communication system to the current link quality of a data communication channel. The adapted transmission parameter is selected by the transmitting node from a set of transmission parameters in dependence on a number of successful transmissions. The number of successful transmissions is compared in the transmitting node against one of a first threshold value corresponding to a first state of the transmitting node and a second threshold value corresponding to a second state of the transmitting node. The method comprises in the transmitting node the steps of (a) counting the number of successful transmissions; (b) selecting the adapted transmission parameter (bl) in response to the number of successful transmissions equaling or exceeding the first threshold value when the transmitting node is in the first state, and (b2) in response to the number of successful transmissions equaling or exceeding the second threshold value when the transmitting node is in the second state; and in dependence of the result of a following transmission, operating the transmitting node in one of the first state and the second state.

WO 2004/004194 A3

Published:
— *with international search report*

(88) Date of publication of the international search report:
4 March 2004

(48) Date of publication of this corrected version:
8 April 2004

(15) Information about Correction:
see PCT Gazette No. 15/2004 of 8 April 2004, Section II

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
8 January 2004 (08.01.2004)

PCT

(10) International Publication Number
WO 2004/004194 A3

(51) International Patent Classification[7]: H04L 1/00

(21) International Application Number:
PCT/IB2003/002784

(22) International Filing Date: 17 June 2003 (17.06.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
02014411.9 28 June 2002 (28.06.2002) EP

(71) Applicant *(for all designated States except US)*: **INTERNATIONAL BUSINESS MACHINES CORPORATION** [US/US]; New Orchard Road, Armonk, NY 10504 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **JELITTO, Jens** [DE/CH]; Sawumerstrasse 11, CH-8803 Rueschlikon (CH). **NOLL BARRETO, Andre** [BR/BR]; R. Gustavo Sampaio 194 ap. 303, CEP-22010-010 Rio de Janeiro, RJ (BR). **TRUONG, Hong, Linh** [DE/CH]; Riferstrasse 30b, CH-8134 Adliswil (CH).

(74) Agents: **KLETT, Peter, M.** et al.; International Business Machines Corporation, Saeumerstrasse 4 / Postfach, CH-8803 Rueschlikon (CH).

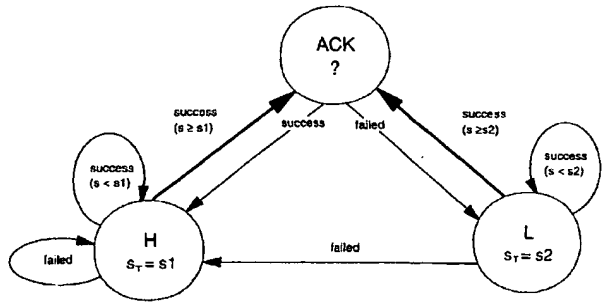
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

[Continued on next page]

(54) Title: LINK ADAPTATION



(57) Abstract: The present invention discloses an apparatus and method for adapting a transmission parameter in a transmitting node of a data communication system to the current link quality of a data communication channel. The adapted transmission parameter is selected by the transmitting node from a set of transmission parameters in dependence on a number of successful transmissions. The number of successful transmissions is compared in the transmitting node against one of a first threshold value corresponding to a first state of the transmitting node and a second threshold value corresponding to a second state of the transmitting node. The method comprises in the transmitting node the steps of (a) counting the number of successful transmissions; (b) selecting the adapted transmission parameter (b1) in response to the number of successful transmissions equaling or exceeding the first threshold value when the transmitting node is in the first state, and (b2) in response to the number of successful transmissions equaling or exceeding the second threshold value when the transmitting node is in the second state; and in dependence of the result of a following transmission, operating the transmitting node in one of the first state and the second state.

WO 2004/004194 A3

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(88) Date of publication of the international search report:
4 March 2004

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

Int[redacted]pplication No
PC[redacted]B 03/02784

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, IBM-TDB, INSPEC, COMPENDEX, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	YU-DONG YAO: "AN EFFECTIVE GO-BACK-N ARQ SCHEME FOR VARIABLE-ERROR-RATE CHANNELS" IEEE TRANSACTIONS ON COMMUNICATIONS, IEEE INC. NEW YORK, US, vol. 43, no. 1, 1995, pages 20-23, XP000487372 ISSN: 0090-6778 page 20, right-hand column, line 8 - line 29 ---	1-12
Y	WO 02 25856 A (APERTO NETWORKS INC) 28 March 2002 (2002-03-28) page 10, line 29 -page 12, line 22 --- -/--	1-12

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 December 2003	29/12/2003

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Agudo Cortada, E

INTERNATIONAL SEARCH REPORT

Application No
PCT/IB 03/02784

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	ANNAMALAI A ET AL: "ANALYSIS AND OPTIMIZATION OF ADAPTIVE MULTICOPY TRANSMISSION ARQ PROTOCOLS FOR TIME-VARYING CHANNELS" IEEE TRANSACTIONS ON COMMUNICATIONS, IEEE INC. NEW YORK, US, vol. 46, no. 10, 1 October 1998 (1998-10-01), pages 1356-1368, XP000791606 ISSN: 0090-6778 page 1356, right-hand column, last line page 1357, left-hand column, line 4 -right-hand column, line 1 ---	1-12
A	EP 1 054 526 A (LUCENT TECHNOLOGIES INC) 22 November 2000 (2000-11-22) paragraph '0011! - paragraph '0015! ---	1-12
A	EP 1 195 936 A (MATSUSHITA ELECTRIC IND CO LTD) 10 April 2002 (2002-04-10) paragraph '0006! -----	1-12

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int[redacted] Application No
PCT/IB 03/02784

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO 0225856	A	28-03-2002	US	6643322 B1	04-11-2003
			AU	9284801 A	02-04-2002
			EP	1320955 A2	25-06-2003
			WO	0225856 A2	28-03-2002
EP 1054526	A	22-11-2000	EP	1054526 A1	22-11-2000
			AU	4583200 A	05-12-2000
			WO	0070810 A1	23-11-2000
EP 1195936	A	10-04-2002	JP	2001333051 A	30-11-2001
			AU	5879701 A	03-12-2001
			EP	1195936 A1	10-04-2002
			CN	1381114 T	20-11-2002
			WO	0191354 A1	29-11-2001
			US	2002106989 A1	08-08-2002